CRN NEWS

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Editor's Comments

This second issue of CRN News comes to you after Network Commissioning, announced January 2004, and before the surge in springtime deployment of more sites. Since the first issue in August last year, important progress has been made with site installations, commissioning, data access, and science experiments.

A current map of installed stations shows the spatial coverage. We plan more installation trips for this spring and summer, bringing us closer towards a goal of 63 sites by year's end. Visit the Site Photo Gallery. Usually two sites are installed during one trip and sites along the way are visited for any annual or necessary maintenance activities. After 30 days of reliable data transmission, and after meeting other criteria outlined in the Commissioning Plan, the site may be commissioned and its data are made available on the CRN website.

With 51 stations operating by mid-March, the USCRN network continues to deliver high-quality data to the archives reliably. We have had our share of hiccups, as any new operational program does experience, including a massive communications failure, later traced to a small leap year fault in a GOES communications component. All data were recovered and since that time monthly communications summary reports have shown greater than 97% of the data are received within the first hour and commonly 99% within the day.

Several thousand hits on the CRN website would indicate the beginning of full operations and use by public and science communities. Feedback from some of these users has already led to improvements in how the data are presented. We encourage continued user feedback. CRN is participating in Earth Day activities in Sterling, VA. A Quality Control Workshop was held in Asheville in January gaining valuable user needs feedback.

Scientific exploration of CRN data is already underway. A critical analysis of CRN and ASOS temperature data was presented in January 2004 in Seattle along with other AMS papers on CRN. Three technical notes are available on the precipitation gauges including performance during a snowstorm and two hardware modifications: a heater unit and a fall prevention device. An intensive field study on gauge performance conducted at two experimental sites and other research is underway. Analysis of Transfer Functions has commenced. This work is vital to integrating the CRN data with the Cooperative Station Data, and will help to calibrate the nation's climate recording systems.

The CRN Program adheres to the Ten Climate Monitoring Principles. Impacts include the recent cooperative effort with the Global Climate Observing System (GCOS) program and the NWS cooperative station program. Agreements were reached for a dual designation of a CRN-GCOS site in Mauna Loa, Hawaii (11,100 ft. level) and for collocating CRN with some of the modernized cooperative stations. By integrating CRN with other networks and programs, CRN provides the nation a first-class observing network that will serve us all.

NEWS from the Field

Besides installation, a lot of field work goes into maintaining CRN sites to the strict standards outlined in the Maintenance Manual. Just how much effort is expended is summarized each month. Monthly Maintenance Summaries present system performance and maintenance activity in a brief, easily digestible format. The summary is based on information in the Anomaly Tracking System (ATS), a database of reports of suspected malfunctions and ensuing maintenance actions, as described in the Configuration Management Plan. These reports were initiated in January 2004, following Network Commissioning.

Monthly reports characterize system reliability and maintenance activity. Network managers identify replaced site components and compare maintenance response with established standards. By summarizing maintenance actions over time, these reports help network managers identify trends that may warrant review of the site configuration, maintenance approach, or logistics practices.

The monthly maintenance summary enumerates, in three tables, failures and maintenance actions recorded in ATS during the reporting period, as well as cumulative information. An excerpt from the February summary is below. Full reports are available upon request.

Site Failures and Maintenance Actions for February 2004, Based on ATS Incident Reports

	2/04	Cumulative for 2004
Active Sites	47	
Site Incidents	5	53*
Incidents due to maintenance error	2	3
Corrective Maintenance Actions	4	57*
ATDD On-Site Corrective Maintenance	2	2
Operation Restored without Maintenance	2	3
Restoration in excess of Established Standards	2 of 5 outages	6 of 55 outages*
Components Replaced	Geonor wire and interface	3 Geonor wires 1 Geonor interface
Annual Maintenance Visits	4	4

* Includes 48 leap year communications failures.

Temperature and Precipitation

"If you are wearing a watch, you know what time it is. If you are wearing two watches, you're not so sure." So the saying goes, and so it is with multiple instruments measuring the same meteorological parameters. The CRN configuration includes three independent measurements of temperature, and two independent measurements of precipitation, platinum resistance thermometers, a tipping bucket, and a Geonor weighing precipitation gauge. The Geonor gauge itself has three semi-independent sensors for measuring precipitation. With all of these multiple measurements at each CRN site, the question is, what's the temperature and how much did it rain?

3 separate thermometers

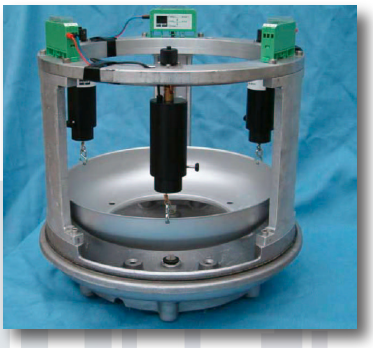
Hourly and daily values of temperature and precipitation are post-processed at NCDC using the multiple observed parameters as inputs. Quality-control personnel, in monitoring the performance of the individual instruments, use all the sensed values on the smallest time step transmitted, presently 15-minutes, to assess the performance of the instruments. Displays of detailed observations are intended for the professional climate science community.

For the casual user, providing one value of temperature and one value of precipitation for each time step was recommended by the CRN ad-hoc science advisory working group. As a result, temperature and precipitation calculation algorithms were developed to provide one official value.

The temperature algorithm ideally takes a median of the three average hourly values transmitted from the station to obtain one hourly value, that is, after checking for potential errors. First, pair-wise differences are calculated among the three thermometers. Secondly, the algorithm examines the speed of the fans for each thermometer; if a fan speed is too low then the value from the corresponding sensor may be suspect. An average of the remaining values is used. Each thermometer is truly independent and the procedures pseudo code is straightforward.

The precipitation algorithm is a bit more complicated. At present, only the Geonor values are used in calculating precipitation. Each of the three sensors in the Geonor produces a measurement of the depth of liquid in the bucket, but as there is only one bucket, the measurements are not fully independent. The gauge is sensitive to wind noise, especially at low precipitation rates. In addition, large changes in depth levels occur when the gauges are emptied and when antifreeze is added. Also, breakage of the sensor wires has to be taken into account. This calls for some special care. The algorithm being used presently for obtaining one value of precipitation for the hour uses depth, precipitation, and frequency information from all three wires at a time step of 15-minutes.

First, pair-wise differences are examined and if they are small, a median is calculated. An average is taken if one sensor is out of tolerance. Second, limit checks are performed to avoid reporting antifreeze as rain, and to reduce noise values creeping into the precipitation totals. Frequency is used to validate instrument performance. Finally, 15-minute values are added up to arrive at time-step totals.



3 depth sensors

Hourly Roundups and Monthly Summaries are prominently displayed and easily accessible. Near-term plans call for a change in the datastream with each CRN site transmitting each hour 5-minute temperature and gauge depth values. With this new datastream will come a new method of calculating hourly and daily temperature and precipitation values. As the algorithm is refined, it will be made available.

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The Site Installation

Installation of CRN sites has proceeded at a fast clip. After approval of the Site License Agreement (SLA), installation of CRN sites follows procedures fully documented in the Installation Documentation. Some non-standard, experimental installations, geared toward future potential improvements are not included. Six sites have been installed with solar power: Tuscon, AZ, Redding, CA, Edinburg, TX, Goodwell, OK, Palestine, TX, and Cape Charles, VA. The site in Elkins, WV was installed with both solar and wind power. Results from the initial solar sites helped resize the solar panel for later sites. Similarly, results from Elkins are guiding decisions for future wind installation. The following table summarizes site installation activity, from survey to commissioning.

Installation Activity as of mid-March 2004	Sites Included
Commissioned Stations	42
Installed Stations	51
Operational	48
Test Sites	3
Pending Installation (signed SLA)	14
Reviewed, Accepted, and Awaiting SLA	16
Surveyed, Awaiting Review	61
Reviewed, not Accepted or Rejected	164
Surveyed, Selection or Deploy Deferred	58